REMARKS

Claims 1, 10-14, and 17-23 remain pending in the present application, Claims 1, 11-12, and 17-22 having been amended, and Claim 9 having been canceled without prejudice or disclaimer. In the changes made by the current amendment, ~~deletions are shown by strikethrough~~, and additions are underlined. Applicants believe that the present amendments and remarks place the application in condition for allowance and respectfully request the same.

In response to the Office Action mailed March 30, 2006, Applicants respectfully request the Examiner to reconsider the above-captioned application in view of the foregoing amendments and the following remarks.

Summary of the Office Action

In the March 30, 2006 Office Action, the Examiner granted Applicants' Request for Continued Examination by withdrawing the finality of the previous Office Action and entering the Applicants' submission filed on January 18, 2006. However, the Examiner rejected Claims 1, 9-14, and 17-23 on the following grounds. First, the Examiner rejected Claims 1, 10-14, and 17-23 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The Examiner then rejected Claims 11-14 and 17-20 under 35 U.S.C. § 112, second paragraph, as being indefinite. Finally, the Examiner rejected Claims 1, 9-14, and 17-23 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,556,416 issued to Kamijo (hereinafter "Kamijo").

Traversal Of Rejection Under 35 U.S.C. § 112, First Paragraph

Applicants respectfully traverse the rejection of Claims 1, 10-14, and 17-23 under Section 112, first paragraph, as failing to comply with the written description requirement in two regards.

The Examiner first argued that the "selecting" step found in the claims was not described in the specification. Although the Applicants believe that the verb "selecting" has at least implicit support in the specification, *see* M.P.E.P. § 2163(I)(B), the Applicants have amended Claim 12 to recite "adjusting a power level" of the laser. The Applicants believe that the specification provides ample support to such a term and that such is not new matter. M.P.E.P. § 2163.07(I).

For example, the specification refers to "gradually increasing the intensity of the CO2 laser beam with 0W, 266W, 750W, 1150W and 1490W . . ." (page 12, lines 14-15) and that "scattered intensities were observed with respect to the respective power levels" (page 13, lines 11-14). Furthermore, the following sections of the specification also illustrate that the power level of the laser may be selected from a variety of wattages: page 8, lines 2-14; page 9, lines 18-20; page 13, lines 2-3; page 14, lines 26-27; page 14, line 29 through page 15, line 25; and page 16, lines 18-23, for example. For this reason, Applicants now believe that this rejection by the Examiner is now overcome, and respectfully request the Examiner to withdraw this rejection.

Further, with respect to Claim 22, the Examiner indicated that there is no support for the combination of a laser that has power to coalesce and convert the particles for a first pass in conjunction with redirecting for a second pass. The Applicants have now amended Claim 22 to clarify that a laser is directed "for a first pass through the flame at a first distance from said burner" and then the laser beam is redirected "for a second pass through the flame at a second distance from said burner," and that the power level of the laser beam is sufficient for the aggregates to coalesce and convert into smaller fine particles "as a result of the combined passes of the laser beam through the flame." This amendment finds support in the disclosure on page 9, lines 6-20, and in Figures 6A-6C. The Applicants respectfully submit that this amendment overcomes the rejection of the Examiner with respect to Claim 22.

Therefore, the Applicants respectfully request that the Examiner withdraw his rejection of Claims 1, 10-14, and 17-23 under Section 112, first paragraph.

Traversal of Rejection Under Section 112, Second Paragraph

Applicants also respectfully traverse the rejection of Claims 11-14 and 17-20 under Section 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter. The Examiner indicated that the various selecting steps read "on a nebulous mental step conducted prior to the manipulative steps of the claimed process, hence rendering the present process claim unclear in meaning and scope." *See* Office Action. The Examiner then indicated that if the Applicant "wishes to patent detail controls over the recited process, then the manipulative process steps must be positively recited." *See* Office Action.

The Applicants respectfully submit that the process steps of Claims 11-14 and 17-20 positively recite patentable manipulative steps of the process. Amended Claim 11 recites the positive, manipulative step of setting the power level of the laser; Claim 12 recites the positive, manipulative steps of supplying, generating, forming, irradiating, and adjusting; Claim 13 recites the positive, manipulative step of collecting fine spherical particles onto a member; Claim 14 recites the positive, manipulative step of irradiating without intersecting the laser with the member; and amended Claims 17-20 each recite the positive, manipulative step of setting the power level corresponding to a certain condition.

Therefore, the Applicants respectfully submit that Claims 11-14 and 17-20 recite positive, manipulative steps, and that the rejection of these claims under Section 112, second paragraph has been overcome. Thus, the Applicants respectfully request that the Examiner withdraw the rejection of these claims under Section 112, second paragraph.

Traversal of Rejection Under Section 103(a)

The Applicants respectfully traverse the rejection of Claims 1, 9-14, and 17-23 under Section 103(a) as being unpatentable over Kamijo. The Examiner apparently provided various bases upon which he justified the rejection.

First, the Examiner argued that the selecting step of Claim 1 was inherent in Kamijo. Secondly, the Examiner argued that *although Kamijo does not teach that the aggregates may be converted into smaller fine, substantially spherical particles*, Kamijo teaches the creation of "super-fine" particles. Thus, given routine experimentation, one may create smaller fine, substantially spherical particles. Finally, the Examiner indicated that although Kamijo does not disclose details regarding the particle nuclei, aggregates, growing, etc., Kamijo does disclose controlling the process via various parameters. Thus, the Examiner argues that it would have been obvious to perform routine experimentation to determine the optimal processing parameters depending upon what size particles are desired.

The Applicants hereby respectfully traverse this rejection and submit that as amended, Claims 1, 9-14, and 17-23 are patentable over Kamijo.

A. In re Claims 1 and 12

As discussed in a prior response to the Examiner's arguments, it appears that the Examiner's rejection of these claims raises at least two issues: (1) inherency and (2) optimization through routine experimentation.

With respect to inherency, the Examiner apparently argues that because Kamijo teaches that super-fine particles are desirable and because Kamijo uses evaporated metals, gas, and a laser, the practice of the Kamijo process would inherently produce spherical particles.

Additionally, the Examiner also apparently argues that Kamijo teaches that the process may be controlled via various parameters (*see* Kamijo, col. 1, lns. 60-63, and col. 2, lns. 65-68). In this regard, the Examiner argues that these parameters may be optimized through routine experimentation in order to produce substantially spherical particles. The Examiner also admits that the limitation of Claim 1, converting the aggregates into smaller fine, substantially spherical particles, is not taught in Kamijo. Therefore, in rejecting Claim 1, the Examiner apparently relies alternatively on inherency and optimization through routine experimentation arguments in order to provide this missing limitation.

For at least the reasons discussed herein, the Applicants respectfully submit that spherical particle feature of Claims 1 and 12 is not inherently present in practicing the method of Kamijo, and that Kamijo does not provide any suggestion or motivation to modify or optimize processed parameters in such a way as to produce substantially spherical particles.

1. The Spherical Particle Limitation Is Not Inherently Present In Kamijo

In order to establish a *prima facie* case of obviousness, every limitation must be taught or suggested by the prior art. *See* M.P.E.P. § 2143. As noted by the Examiner in the Office Action, Kamijo does not teach the conversion of aggregate into smaller fine, substantially spherical particles, which is a feature of amended Claims 1 and 12. Regardless, the Examiner argues that because Kamijo teaches the creation of "super-fine" particles, one of skill in the art would somehow decide to make these "super-fine" particles into spherical particles because "for a given particle mass, a sphere would correspond to the smallest particle." *See* Office Action.

The Applicants respectfully submit that it appears that the Examiner's argument improperly confuses particle *size and mass* with particle *shape*. Indeed, although a particle may

be very small, it may also have any of a variety of shapes. It is true that Kamijo teaches the creation of "super-fine" particles; however, without any other teaching in Kamijo, "super-fine" or "fine" can only be interpreted by its ordinary meaning as referring to *size*. The American Heritage dictionary confirms the ordinary meaning of "fine" to include: "[v]ery **small** in **size**, **weight**, or thickness; . . . Consisting of very **small** particles; not coarse."[1]

The Office Action seems to equivocate the meaning of "super-fine" and minimum ***density***: "Kamijo teaches the creation of 'super-fine' particles . . . and that such are in strong demand. *Clearly for a given particle **mass**, a sphere would correspond to the **smallest** particle.*" *See* Office Action. As is well known, particle mass (measurable in units such as kilograms) is not equal to particle size (i.e. volume, measurable in units such as cubic meters)—these are completely different physical properties. However, these properties do relate in defining the density (measurable in mass per unit volume). Nevertheless, the Examiner is incorrect in making the illogical leap to equate "super-fine" with "spherical." Accordingly, the Applicants respectfully believe that because of this misconception, the Examiner has improperly concluded that spherical particles are inherently produced by the Kamijo process.

In order to illustrate this point, Applicants first note that without implementing embodiments of the present Application, one may coalesce (i.e. fuse) several particles into a combined particle that has pockets, pores, and/or voids. Further, one may also certainly create "super-fine" particles that have pockets, pores, and/or voids. It is noted that aggregates can be also super-fine particles since one aggregate consists of many super-fine particles. However, as recited in each of the independent claims of the present Application, the laser beam is irradiated into the aggregates in order to coalesce and convert the aggregates into smaller fine particles. In order to combine the coalescing particles into small particles, the present Application teaches that the ***shape*** of the combined particle is controlled—that a *single spherical particle is formed from*

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[1] "fine." The American Heritage® Dictionary of the English Language, Fourth Edition. Houghton Mifflin Company, 2004. Answers.com 14 Jul. 2006. http://www.answers.com/topic/fine.

several coalesced particles. Explained in other terms, by forming a single, spherical particle from several individual particles, a maximum-density particle is obtained.[2]

In contrast, while the Kamijo reference apparently teaches that "super-fine" particles are created by ionizing a mixed gas and simultaneously irradiating the mixed gas to cause the mixed gas to undergo a reaction with a flame, such does not disclose the coalescence of aggregate in order to form maximum-density spherical particles. Indeed, not only does Kamijo fail to teach the feature of coalescence of aggregates, but in addition, because Kamijo does not teach this limitation, it cannot be said that spherical particles *necessarily* result from the practice of the Kamijo process because it is *not even a consideration* of Kamijo. Although Kamijo may teach of ***small*** particles, Kamijo discloses nothing with regard to forming spherical particles of ***maximum density***. Again, super-fine particles may not be necessarily spherical particles, but they may have any shapes in small size.

This point is further supported by the realization that the process considerations for the Kamijo process and the Applicants' method are distinct and different from one another. As discussed above, the Kamijo process expressly focuses on producing "super-fine" particles, but does not indicate anything with regard to the particle shape and therefore *cannot* teach particle density. In contrast, according to embodiments of the Applicants' method claims, the shape *and* size of the particles are controlled. For example, as aggregates coalesce, the aggregates collide and form into small but lumpy particles. As discussed above, substantially spherical particles of a maximum density can be produced from (lumpy) aggregates.

Thus, the Applicants' methods can result in coalescing aggregates into spherical particles while Kamijo merely focuses producing "super-fine" particles through ionization, irradiation, and reaction of a mixed gas with a flame. The Kamijo process does not necessarily produce spherical particles.

For at least these reasons, the Applicants respectfully submit that the creation of spherical particles is not inherent in the Kamijo reference. Kamijo does not teach that particle shape should optimally be spherical, and Kamijo also does not suggest that such shape is actually (or even possibly) obtained when practicing the Kamijo process. As mentioned above, Kamijo is

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[2] This point is illustrated with reference to Applicants' Claim 10, which recites, "collision cross sections of [the] aggregates are greater than collision cross sections of the fine

apparently more concerned with reducing particle *size*, rather than creating a particular particle *shape* or a particle of maximum density. A mere possibility or probability that a result would occur does not support a finding of inherency. *In re Oelrich*, 666 F.2d 578, 212 U.S.P.Q. 323, 326 (CCPA 1981).

Therefore, the Applicants respectfully submit that Claims 1 and 12, as well as Claims 10-11, 13-14, and 17-20, which depend therefrom, are patentable over Kamijo. Thus, Applicants respectfully request that the Examiner withdraw the rejection of these claims under Section 103(a) and indicate that these claims are allowable.

2. Kamijo Does Not Provide Sufficient Teachings To Support The Optimization Argument Proposed By The Examiner

In the Office Action, the Examiner has also argued that it would have been obvious to perform routine experimentation to determine optimal processing parameters of the Kamijo process in order to produce spherical particles. This argument appears to be in the alternative to the Examiner's first argument regarding inherency. Applicants respectfully submit that controlling the Kamijo process parameters in the way suggested by the Examiner would not have been routine, and nothing in Kamijo teaches that these parameters are result-effective variables.

The Examiner has broadly argued that "it would have been obvious to perform routine experimentation to determine optimal processing parameters—depending upon what sized particles are desired." *See* Office Action. However, *the Examiner has failed to indicate what specific parameters Kamijo teaches as being manipulatable.* Furthermore, the Examiner apparently fails to indicate how it would be obvious to one of skill in the art to modify the teachings of Kamijo where the necessary process parameters are not discussed, much less are not discussed as being manipulatable, nor that such manipulation would tend to provide spherical particles.

The Examiner pointed to two specific areas in the Kamijo reference that discuss potential adjustments to the process; however, such discussion in Kamijo appears lacking. *See* Kamijo, col. 1, lns. 60-63, and col. 2, lns. 65-68. In these two citations, Kamijo first teaches that the reaction which forms the fine particles can be controlled by adjusting the amount (rate) of carrier

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particles produced from said aggregates."

gas supplied. *See* Kamijo, col. 1, lns. 60-63. Second, Kamijo teaches that laser beams and ionization can be controlled independently of each other in order to improve energy efficiency. *See* Kamijo, col. 2, lns. 65-68.

This latter teaching only suggests independent control, which is quite far removed from individual selective variation or adjustment of the laser alone. It therefore appears that neither of these two citations teach or suggest that the particle can be made spherical by modifying parameters such as power level or wavelength of the laser. Instead, these citations apparently teach in broad terms that the reaction can be controlled by gas flow rate, and that energy efficiency may be improved by independent control of the laser and ionization. Indeed, the only citation that discusses the laser beam apparently only refers to increasing energy efficiency, and not to altering the shape of the particle to be spherical. In fact, changing the power level and/or wavelength of the laser would not *necessarily* or always increase energy efficiency, and consequently, Kamijo appears to focus on an entirely different principle in teaching independent laser control.

It is also possible that the Examiner may again point to the apparent focus of Kamijo, which is to produce "super-fine" particles, in order to support his argument that one of skill in the art would be able to routinely experiment with the process parameters related to the laser in order to develop spherical particles. Nothing in Kamijo or in any other evidence of record teaches that that one of skill in the art would routinely experiment to create spherical or cuboid particles.

Given the teachings of Kamijo, one of skill in the art would only apparently be motivated to produce ***super-fine*** particles, not particles of a given ***shape***. There is no teaching in Kamijo or any other evidence of record that apparently teaches or suggests that decreasing particle size *necessarily* means creating spherical particles. Furthermore, there is no motivation to do so or related reasonable expectation of success in Kamijo or of record. While the Applicants' claims recite the creation of spherical particles (due to the need to coalesce aggregates into small particles of maximum density), Kamijo only apparently teaches that small particles may be produced by mixing a gas of a volatile metal compound with a reaction gas, ionizing the mixture, and heating the ionized mixture with a laser beam to produce the particles.

Furthermore, Kamijo does not teach that the laser power level and wavelength are result-effective variables. As understood, Kamijo does not teach particle ***shape*** can be affected by

power level and wavelength of the laser—thus, these are not recognized as manipulatable parameters that affect the coalescence of aggregates in the system. Therefore, because Kamijo does not teach or suggest that these parameters are result-effective variables, the creation of spherical-shaped particles would not obvious and one of skill in the art would not have routinely experimented to modify such parameters in order to create spherical-shaped particles. These parameters would not be tested or altered through routine experimentation because they are not recognized as result-effective variables.

Finally, Applicant also notes that Kamijo fails to teach the controllability of any phase, such as a crystalline phase of fine particles. In contrast, Claim 11 recites, *inter alia*, "setting the power level of said laser corresponding to a phase of the fine particles thereby controlling the phase of the fine particles." Thus, Claim 11 also adds additional patentable subject matter that is also not taught or suggested in Kamijo.

Therefore, the Applicant respectfully submits that Kamijo does not make obvious the coalescence of aggregates to form smaller fine, spherical particles. Because Kamijo fails to teach or suggest at least this feature of Claims 1 and 12, Kamijo does not make these claims obvious. Therefore, the Applicants respectfully request that the Examiner indicate the allowance of Claims 1 and 12, as well as Claims 10-11, 13-14, and 17-20, which depend therefrom.

B. In Re "Selecting Step" Limitation

The Examiner argued that the selecting step formed in Claims 1, 12, and 21 was inherent in Kamijo. The Applicants respectfully submit that "selecting a power level of said at least one laser beam sufficient to cause said aggregates to coalesce and convert into smaller fine, substantially spherical particles" is certainly not inherent in Kamijo.

As discussed above, Applicants believe that Kamijo does not teach or suggest that aggregates may be irradiated by a laser beam—***at any power level***—to create substantially spherical particles. Because Kamijo fails to teach or suggest that substantially spherical particles may be created, the Applicants respectfully submit that Kamijo does not inherently disclose selecting a power level sufficient to coalesce and convert aggregate into substantially spherical particles.

However, Applicants have amended Claims 1, 12, and 21 to remove reference to the step of "selecting" the laser power, and thus these claims are now broader. These claims now recite, among other recitations, irradiating at least one laser beam into said aggregates that has a power level sufficient to cause said aggregates to coalesce and convert said aggregates into smaller fine, substantially spherical particles. Applicants have removed positive recitation of a selecting step in order to simplify the claims and to expedite allowance of the application. Therefore, in any event, the Examiner's argument that the selecting step is inherently disclosed in Kamijo is now moot.

C. In Re Claim 21

The Applicants also traverse the rejection of Claim 21. Amended Claim 21 recites, *inter alia*, "irradiating at least one laser beam into said aggregates in the flame at a power level sufficient for said aggregates to coalesce and convert into smaller fine particles; and positioning said at least one laser beam to irradiate into the flame at a distance from said burner, wherein said distance has a positive correlation to said flow rate." The Applicants reemphasize the arguments discussed in greater detail above regarding the novelty and non-obviousness of the coalescence of aggregates and the placement/orientation of the laser. Further, for many of the same reasons, Applicants submit that Kamijo fails to teach that the laser may be positioned/irradiated in a manner *related to the flow rate of the gas*. Thus, Applicants submit that Claim 21 should be allowable over Kamijo, and respectfully request that the Examiner withdraw the rejection of Claim 21 under section 103(n) in view of Kamijo.

D. In Re Claims 22 and 23

The Applicants also traverse the rejection of Claims 22 and 23. In the Office Action, the Examiner also based this rejection on the argument that although Kamijo "does not teach the redirecting of the laser beam" and "gives no guidance as to laser placement," it would have been obvious to perform routine experimentation to determine optimal laser placement, including laser location/orientation and redirection (i.e. redirecting optical path). *See* Office Action.

As amended, Claim 22 recites, *inter alia*, "directing a laser beam for a *first pass* through the flame at a first distance from said burner; and redirecting the laser beam for a *second pass*

through the flame at a second distance from the burner; wherein a power level of the laser beam is sufficient for *said aggregates to coalesce and convert into smaller fine particles as a result of the combined passes* of the laser beam through the flame." The Applicants respectfully submit that Kamijo does not teach or suggest at least the above limitation of Claim 22.

The Examiner has broadly argued that it would be routine experimentation to determine optimal laser placement. However, the Examiner has failed to provide any motivation whereby one of skill in the art would alter the orientation of the laser disclosed in Figure 1 of Kamijo. Furthermore, Kamijo does not teach that laser direction, position or optical path are result-effective variables that can be modified. For reasons similarly discussed above, because laser orientation and optical path are not discussed in Kamijo, and the Examiner has not provided any evidence to indicate otherwise, one of skill in the art would not modify laser orientation or optical path through routine experimentation to arrive at the method recited in Claim 22. Therefore, the Applicant respectfully submits that laser orientation and optical path redirection are not disclosed as result-effective variables, and would not be modified through routine experimentation.

In addition, the Applicants also respectfully submit that it would not be obvious to modify the Kamijo reference to produce the method disclosed in Claim 22 and as shown in Figure 6b of the Applicants' specification. Referring specifically to Figure 6b, it is illustrated that the laser beam is cross-irradiated into the flame by the user of a plurality of mirrors. *See* Applicants' Application, p. 9, lns. 6-20; Figure 6b. As noted by the Applicants, the cross-irradiation of the laser beams provides multi-incidence that "allows effective utilization of laser energy by irradiating a laser beam several times in accordance the movement of particles." Applicants' Application, p. 9, lns. 15-17. Although Kamijo discloses that the independent control of the laser beam and ionization can improve energy efficiency, Kamijo appears to be completely devoid of any teaching or suggestion that cross-irradiation to create multi-incidence of the laser beam could be used to provide effective utilization of laser energy.

Furthermore, Claim 23, which depends from Claim 22, recites additional limitations that further define the process. In this regard, and at least for the reason that Claim 23 depends from an allowable base claim, Claim 23 is allowable.

Therefore, the Applicants respectfully request that the Examiner withdraw the rejection of Claims 22-23 under Section 103(a) as being obvious in light of Kamijo, and indicate that these claims are patentable over the art of record.

Conclusion

The Applicants respectfully submit that the above rejections have been overcome and that the present application is now in condition for allowance. Therefore, the Applicants respectfully request that the Examiner indicate allowance of Claims 1, 10-14, and 17-23. Accordingly, early issuance of a Notice of Allowance is most earnestly solicited.

Any remarks in support of patentability of one claim should not be imputed to any other claim, even if similar terminology is used. Any remarks referring to only a portion of a claim should not be understood to base patentability on solely that portion; rather, patentability must rest on each claim taken as a whole. Applicants have not presented arguments concerning whether the applied references can be properly combined in view of the clearly missing elements noted above. Applicants reserve the right to later contest whether a proper motivation and suggestion exists to combine these references, taking into account the disclosure in the applied references that teaches away from the combination made in the pending Office Action.

The undersigned has made a good faith effort to respond to all of the rejections in the case and to place the claims in condition for immediate allowance. Nevertheless, if any undeveloped issues remain or if any issues require clarification, the Examiner is respectfully requested to call Applicants' attorney in order to resolve such issue promptly.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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